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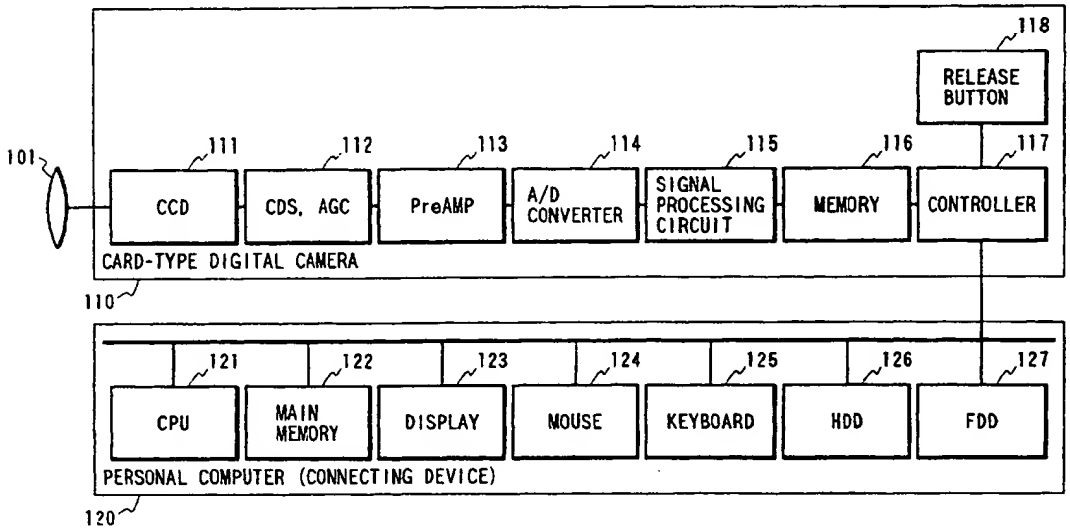
(54) Camera, camera connecting device, and camera system

(57) In a digital camera system used by connecting it to a computer or the like, a still image can be stored by acting upon a release button of the camera. To this end, a card-type digital camera used by connecting it to a personal computer is provided with the release button for controlling the connected personal computer, an actuation of this release button being processed by software running on a CPU of the personal computer. The release button of the camera may be used to have a desired function by providing a function selecting unit of application software.

FIG. 1



EP 0 848 548 A2

Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a camera used with removably being connected it to an external connecting device such as a personal computer, a personal digital assistant (PDA: information terminal equipment) and a word processor, and to a connecting device of such the camera and a camera system including such the camera and connecting device.

Related Background Art

A digital camera for digital recording is known such as shown in Fig. 7. In Fig. 7, reference numeral 710 represents a card-type digital camera, and reference numeral 720 represents a general personal computer (hereinafter called a PC). The internal structures thereof are shown in block in Fig. 7.

In the structures shown in Fig. 7, a subject image passed through a lens 701 of an optical system is picked up by an image pickup element CCD 711, subjected to predetermined processes such as CDS and AGC, and amplified to a predetermined level by a pre-amplifier 713. The analog image signal is then converted into a digital image signal by an A/D converter 714, processed by a signal processing circuit 715, and temporarily stored in a memory 716.

The above-described operations are controlled by a controller 717 which also outputs an interrupt signal to a PC 720. Upon reception of this interrupt signal, PC 720 performs an interrupt routine.

PC 720 is generally constituted of a CPU 721, a main memory 722, a display 723, a mouse 724, a keyboard 725, an HDD 726, an FDD 727 and a local bus 728.

In such a conventional card-type digital camera system, the interrupt routine of PC 720 copies an image in the memory 716 into the main memory 722 under the control of CPU 721 of PC 720. This copied image is displayed on the display 723 by an application program. If these operations are performed successively, a moving image can be displayed. If a space key of the keyboard is depressed during the display of a moving image, a still image can be saved in a clip board or in a disk medium such as a hard disk.

With such a conventional camera system of the type that a camera head unit and a camera card are interconnected by a cable, a still image can be picked up only by actuating a keyboard or mouse of a PC.

SUMMARY OF THE INVENTION

The present invention has been made in order to solve the above problem and aims at providing a camera capable of picking up a still image by actuating a release switch of the camera, its connecting device and a camera system thereof.

According to one aspect of the present invention, a camera is configured as in the following.

(1) A camera removably connected to an external connecting device wherein the function of a release switch of the camera can be changed by the connecting device connected to the camera.
(2) The camera described in (1), wherein the release switch is used to have a desired function, by the provision of selecting means in application software.
(3) The camera described in (1), wherein there is provided a medium for storing a status of the release switch, the medium being changed as desired by selecting means provided in application software.
(4) The camera described in (3), wherein the medium is a disk.
(5) The camera described in (3), wherein the medium is a shared memory.
(6) The camera described in (1), wherein an interrupt signal is sent to the connecting device upon the actuation of the release button, and in response to the interrupt signal, the connecting device processes an image signal picked up with the camera.

According to another aspect of the present invention, a camera connecting device is configured as in the following.

(7) A connecting device removable connected to a camera, comprising input means having the same function as a release switch of the camera.
(8) A connecting device removable connected to a camera, comprising means for detecting whether the camera is equipped with a release switch.

According to still another aspect of the present invention, a camera system is configured as in the following.

(9) A camera system having a camera and a connecting device for removably connecting the camera, comprising means for detecting whether a camera with a release switch or a camera without a release switch is connected.
(10) The system described in (9), the system is adapted to start up a photographing operation by the release switch of that camera, when the camera having the release switch is connected.
(11) The system described in (9), wherein a display of the delecting means is changed according to whether the camera with the release switch or the camera without the release switch is connected.

Other features of the present invention will become more apparent from the following detailed description of embodiments when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing the structure of a camera system of this invention.

Fig. 2 is a flow chart illustrating the operation of a camera side according to a first embodiment of the invention.

Figs. 3A and 3B are flow charts illustrating the operation of a connecting device side according to the first embodiment of the invention.

Fig. 4 is a flow chart illustrating the operation of a connecting device side according to a second embodiment of the invention.

Fig. 5 is a flow chart illustrating the operation of a connecting device side according to a third embodiment of the invention.

Figs. 6A and 6B are flow charts illustrating the operation of a connecting device side according to a fourth embodiment of the invention.

Fig. 7 is a block diagram showing the structure of a conventional camera system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a block diagram showing the structure of a camera system of the invention, the structure being basically the same as that of the system shown in Fig. 7.

In Fig. 1, reference numeral 101 represents a lens of an optical system for focussing a subject image, and reference numeral 110 represents a card-type digital camera capable of being removably mounted on a card slot of a PC 120 which is an external connecting device. The camera 110 has an electrical circuit for interconnecting the optical system and PC 120 together.

In the card-type digital camera 110, reference numeral 111 represents an image pickup CCD for converting a subject image (optical image) passed through the lens 101 of the optical system into an electrical signal. Reference numeral 112 represents a correction circuit for performing predetermined signal processing such as CDS and AGC. Reference numeral 113 represents a pre-amplifier for amplifying the signal corrected by the correction circuit 112. Reference numeral 114 represents an A/D converter for converting the amplified analog image signal into a digital image signal. Reference numeral 115 represents a signal processing circuit for performing predetermined digital signal processing. Reference numeral 116 represents a writable memory, reference numeral 117 represents a controller for controlling the whole operation of the camera system, and reference numeral 118 represents a release button (switch).

In PC 120, reference numeral 121 represents a CPU for controlling the whole operation of PC, reference numeral 122 represents a main memory, reference numeral 123 represents a display for displaying various information, reference numerals 124 and 125 represent a mouse and a keyboard as input means, reference numeral 126 represents an HDD, and reference numeral 127 represents an FDD. These elements are connected via a local bus 128 to the controller 117.

The external connecting device such as PC 120 may be a PDA, a word processor or the like. In this embodiment, PC is used by way of example.

Next, the operation of the camera system of the first embodiment will be described with reference to Figs. 2, 3A and 3B.

Fig. 2 is a flow chart illustrating the operation of release means on the camera side. After a power of the camera 110 is turned on at Step S201, it is checked at Step S202 whether the release button 118 is depressed. If depressed, the flow advances to Step S203, whereas if not, the flow remains at Step S202 to monitor a depression of the release button 118.

At Step S203 the controller 117 sets a release flag to an interrupt signal. Next at Step S204 an interrupt request is issued to the PC side. At Step S205 an interrupt process is performed on the PC side to thereafter terminate this process.

Figs. 3A and 3B are flow charts illustrating the operation to be performed on the PC (connecting device) side, this operation corresponding to the interrupt process at S205 on the PC side shown in Fig. 2. Fig. 3A illustrates the processes of device driver software and application software, and Fig. 3B illustrates a freeze process.

When the interrupt process starts at Step S301, it is checked at Step S302 whether the release flag is set. If set, the flow advances to Step S303, whereas if not, the flow advances to Step S304 whereat the release interrupt process of device driver software is terminated.

At Step S303, a message "WM_RELEASE" is output (PostMessage) to the application software. PostMessage is a standard function of Windows API for sending a message to an application. Windows API is an application programming interface of Microsoft Windows (registered trademarks or trademark of Microsoft, Corporation). This message is not immediately processed by the application but is loaded in a message queue.

Therefore, the message from the driver software does not synchronize with a freeze process (to be later described) of the application software. This message may be made synchronous. However, in this case, a message notified to each application is assigned uniquely so that the application which does not know this message cannot run.

When the application program starts at Step S305, the message is picked up (GetMessage) from the message queue at Step S306. At Step S307 it is checked

whether WM_RELEASE==TRUE. If true, the flow advances to Step S308, whereas if not, this release interrupt process is terminated at Step S309.

At Step S308 the freeze process is performed to terminate this release interrupt process at Step S309.

The freeze process starts at Step S310. Before this operation, the display 123 of PC 120 is in a preview state. In this preview state, a moving image is continuously displayed on the display 123 by copying image data from the memory 116 of the card-type camera 110 to the main memory 122 of PC 120. In this preview state, the main memory 122 of PC 120 is used temporarily and when new image data is copied, the contents of the main memory 122 are overwritten.

At Step S311 image data in the memory 116 of the camera 110 is copied to the main memory 122 of PC 120. This main memory is a semiconductor storage medium such as a DRAM, and image data in the main memory 122 may be copied later to a disk in the form of image file. Next at Step S312 the image data in the main memory 122 of PC 120 is displayed on the display 123 as a still image to terminate this freeze process at Step S313.

The second embodiment of this invention will be described. In this embodiment, the application software is changed as shown in Fig. 4 in order to use the release button 118 of the camera 110 for the actuation of the freeze (release) process.

Fig. 4 is a flow chart illustrating an interrupt process on the PC side with device driver software, application software and an event from an input device.

When the interrupt process starts at Step S401, it is checked at Step S402 whether the release flag is set. If set, the flow advances to Step S403, whereas if not, the flow advances to Step S404 whereat the release interrupt process of device driver software is terminated.

At Step S403, a message "WM_RELEASE" is output (PostMessage) to the application software. Such a message notified to each application is assigned uniquely so that the application which does not know this message cannot run.

When the application program starts at Step S405, the message sent in response to a mouse event, a keyboard event or from the driver software is picked up from the message queue at Step S406. This event was issued from the input device such as a mouse and loaded in the message queue in a first-in first-out (FIFO) manner in OS such as Microsoft ® Windows ® 95 or a Windows system. At Step S407 it is checked whether WM_RELEASE==TRUE. If true, the flow advances to Step S408, whereas if not, this release interrupt process is terminated at Step S409.

At Step S408 the freeze process is performed to terminate this release interrupt process at Step S409.

As above, a user can use the release request of the camera and the freeze request of the application software as release buttons of the same function, since the both requests are processed as the same request.

Next, the third embodiment of the invention will be described. The application program is changed as shown in Fig. 5 to set the release button 118 of the camera 110 to have a desired function including saving a still image into a disk, saving a still image into a clip board, and not saving a still image.

Fig. 5 is a flow chart illustrating the interrupt process on the PC side with device driver software and application software.

When the interrupt process starts at Step S501, it is checked at Step S502 whether the release flag is set. If set, the flow advances to Step S503, whereas if not, the flow advances to Step S504 whereat the release interrupt process of device driver software is terminated.

At Step S503, a message "WM_RELEASE" is output (PostMessage) to the application software. When the application program starts at Step S505, a desired function is selected from a menu supplied by the application program at Step S506. If the still image is to be saved in the disk, diskFlag=ON and clipFlag=OFF are set. If the still image is to be saved in a clip board, diskFlag=OFF and clipFlag=ON are set. If the still image is not saved, diskFlag=OFF and clipFlag=OFF are set.

Next at Step S507 the message from the driver software is picked up from the message queue. At Step S508 it is checked whether WM_RELEASE==TRUE. If true, the flow advances to Step S509, whereas if not, this release interrupt process is terminated at Step S513.

If diskFlag==ON at Step S509, the flow advances to Step S511, whereas if not, the flow advances to Step S510. If clipFlag==ON at Step S510, the flow advances to Step S512, whereas if not, the flow advances to Step S513. At Step S511, the still image is written in the disk which may be a hard disk, a floppy disk, a removable hard disk flash disk, compact flash disk, or a magnetooptical disk.

At Step S512 the still image is written in a clip board used as a system shared memory provided by OS such as Microsoft ® Windows ® 95. By using this clip board, the still image may be pasted to another application or the like.

As above, a user selects a desired function from the menu supplied by the application program so that the function of the release button 118 of the camera 110 can be set to one of saving a still image into a disk, saving a still image into a clip board, and not saving a still image.

Next, the fourth embodiment of the invention will be described. The application program is changed as shown in Figs. 6A and 6B to allow discrimination between a camera with a release button and a camera without a release button.

Figs. 6A and 6B are flow charts illustrating the operation of the interrupt process on the PC side. Fig. 6A illustrates the operation to be executed by the camera, device driver software and application software, and Fig. 6B illustrates the contents of a camera to be dis-

played.

As a camera 110 is loaded at Step S601, a haveReleaseSW is set at Step S602 to thereafter terminate this camera side process.

As the driver software is activated at Step S604, information on a presence/absence of the release button 118 of the camera 110 is acquired at Step S605. If haveReleaseSW==ON at Step S606, the flow advances to Step S607, whereas if not, the flow advances to Step S608 to terminate the device driver process.

At Step S607 a message "haveReleaseSW" is output (PostMessage) to the application software. As the application program starts at Step S609, the message is acquired from the message queue at Step S610. If haveReleaseSW==ON at Step S611, the flow advances to Step S612, whereas if not, the flow advances to Step S615.

At Step S612 a resource for displaying a dialogue for selecting release means is set. In this case, the dialogue resource for selecting release means is set if haveReleaseSW==ON, and is not set if haveReleaseSW==OFF.

At Step S613, the dialogue for selecting release means is displayed. This dialogue is a kind of window generated either by an application with windows or an application without windows.

Next at Step S614 the release means is selected to perform the freeze process at Step S615. This application program terminates at Step S616.

At Step S617, the release means may be selected upon a mouse event or a keyboard event of the input device. The release operation may be performed by the camera or the input device such as a mouse and a keyboard at Step S618.

At Step S619, the contents in the storage medium of the camera are displayed at Step S619. The contents are haveReleaseSW==ON for the camera with a release button and haveReleaseSW==OFF for the camera without a release button.

As described so far, according to the present invention, it is possible to take a still image by operating upon the release button of a camera, although the keyboard or mouse of the connecting device has been used conventionally for this purpose. It is therefore possible to take a still image even if the connecting device and the camera head are positioned remotely.

Further, a user can use the same function of taking a still image either from the freeze request of the application software (in response to an event issued from an input device such as a keyboard and a mouse) or from the release request of the camera. A user can therefore selectively use one of them which suits for image pickup environments.

Still further, the function of the release button can be set as desired by the application software.

Still further, by providing means for discriminating between a camera with a release button and a camera without it, both the cameras with and without a release button can be used with the same driver and application software.

Many widely different embodiments of the present invention may be constructed without departing from the spirit and scope of the present invention. It should be understood that the present invention is not limited to the specific embodiments described in the specification, except as defined in the appended claims.

Claims

1. A camera removably connected to an external connecting device wherein the function of a release switch of the camera can be changed by the connecting device connected to the camera.

2. A camera according to claim 1, wherein the release switch is used to have a desired function, by the provision of selecting means in application software.

3. A camera according to claim 1, comprising a medium for storing an status of the release switch, the medium being changed as desired by selecting means provided in application software.

4. A camera according to claim 3, wherein the medium is a disk.

5. A camera according to claim 3, wherein the medium is a shared memory.

6. A camera according to claim 1, wherein an interrupt signal is sent to the connecting device upon the actuation of the release button, and in response to the interrupt signal, the connecting device processes an image signal picked up with the camera.

7. A connecting device removable connected to a camera, comprising input means having the same function as a release switch of the camera.

8. A connecting device removable connected to a camera, comprising means for detecting whether the camera is equipped with a release switch.

9. A camera system having a camera and a connecting device for removably connecting the camera, comprising means for detecting whether a camera with a release switch or a camera without a release switch is connected.

10. A camera system according to claim 9, wherein said system is adapted to start up a photographing operation by the release switch of said camera, when the camera with the release switch is connected.

11. A camera system according to claim 9, wherein a

display of said detecting means is changed according to whether the camera with the release switch or the camera without the release switch is connected.

12. A card type digital camera adapted to be connected for a personal computer and having switching means, and wherein the camera is provided with switch means whereby software resident in the personal computer can be controlled when the camera is connected to the personal computer.

FIG. 1

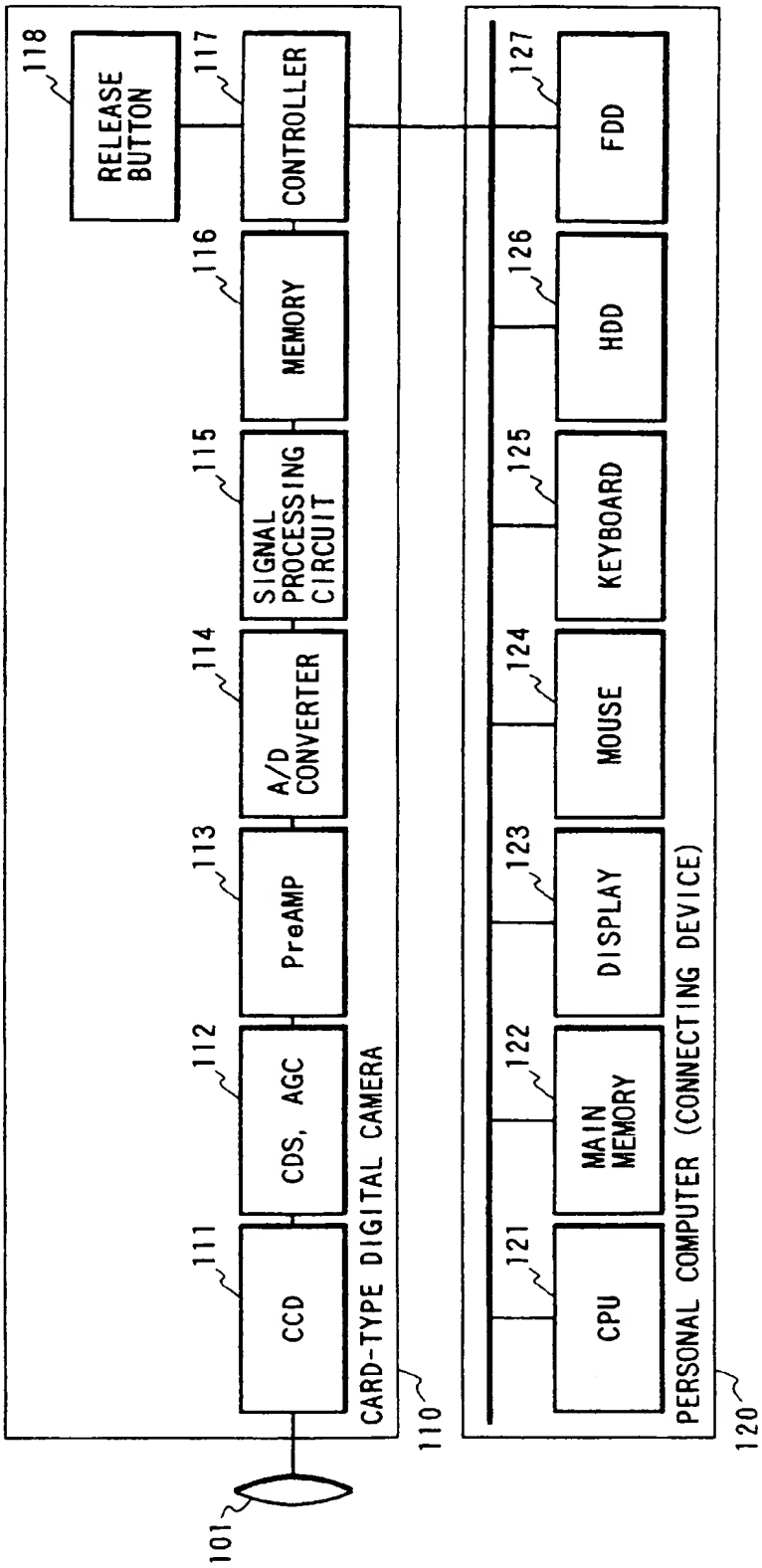

CARD-TYPE DIGITAL CAMERA
110
PERSONAL COMPUTER (CONNECTING DEVICE)
120
101
CCD
111
CDS, AGC
112
PreAMP
113
A/D CONVERTER
114
SIGNAL PROCESSING CIRCUIT
115
MEMORY
116
CONTROLLER
117
RELEASE BUTTON
118
CPU
121
MAIN MEMORY
122
DISPLAY
123
MOUSE
124
KEYBOARD
125
HDD
126
FDD
127

FIG. 2

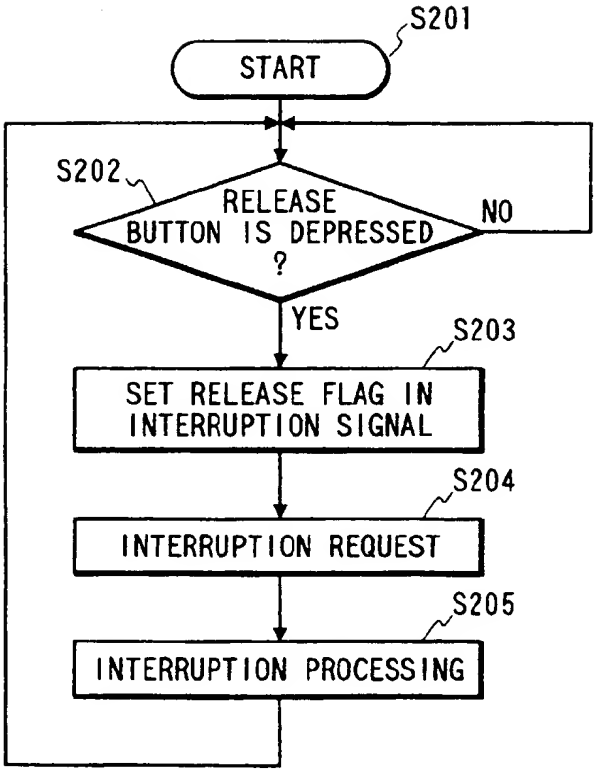

S201
START
S202
RELEASE BUTTON IS DEPRESSED ?
NO
YES
S203
SET RELEASE FLAG IN INTERRUPTION SIGNAL
S204
INTERRUPTION REQUEST
S205
INTERRUPTION PROCESSING

FIG. 3A

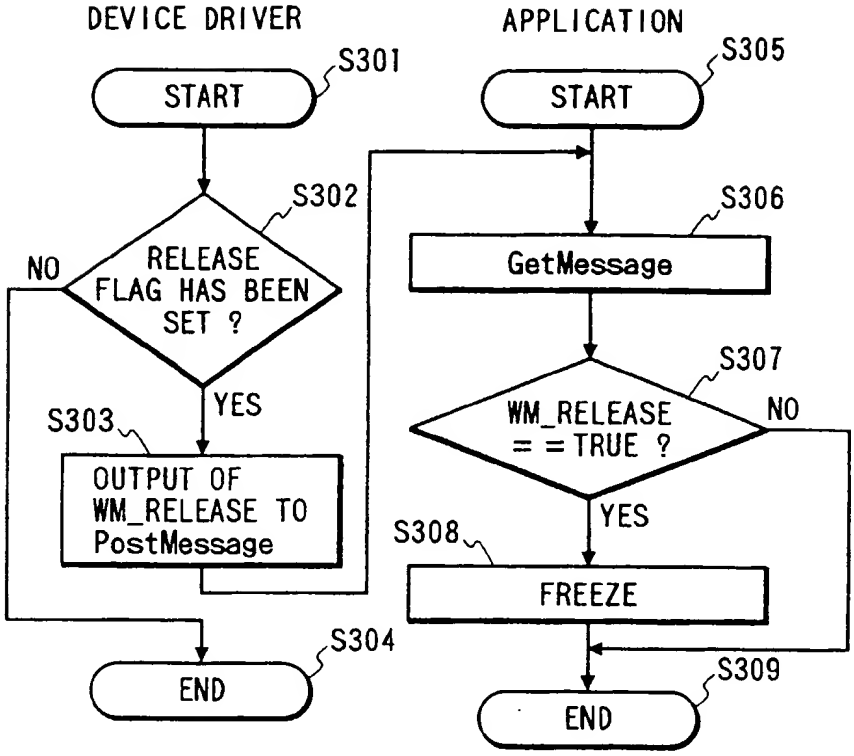

DEVICE DRIVER
APPLICATION
START
S301
START
S305
S302
RELEASE FLAG HAS BEEN SET ?
NO
YES
S303
OUTPUT OF WM_RELEASE TO PostMessage
S306
GetMessage
S307
WM_RELEASE = = TRUE ?
NO
YES
S308
FREEZE
S304
END
S309
END

FIG. 3B

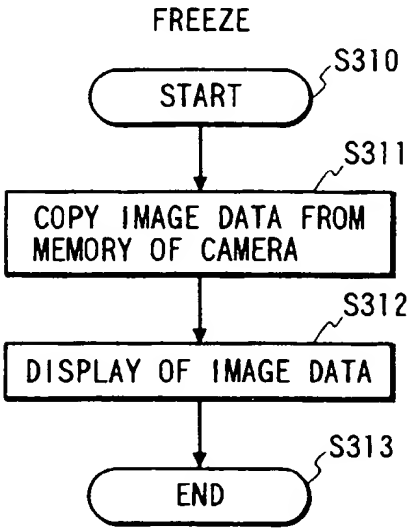

FREEZE
START
S310
S311
COPY IMAGE DATA FROM MEMORY OF CAMERA
S312
DISPLAY OF IMAGE DATA
S313
END

FIG. 4

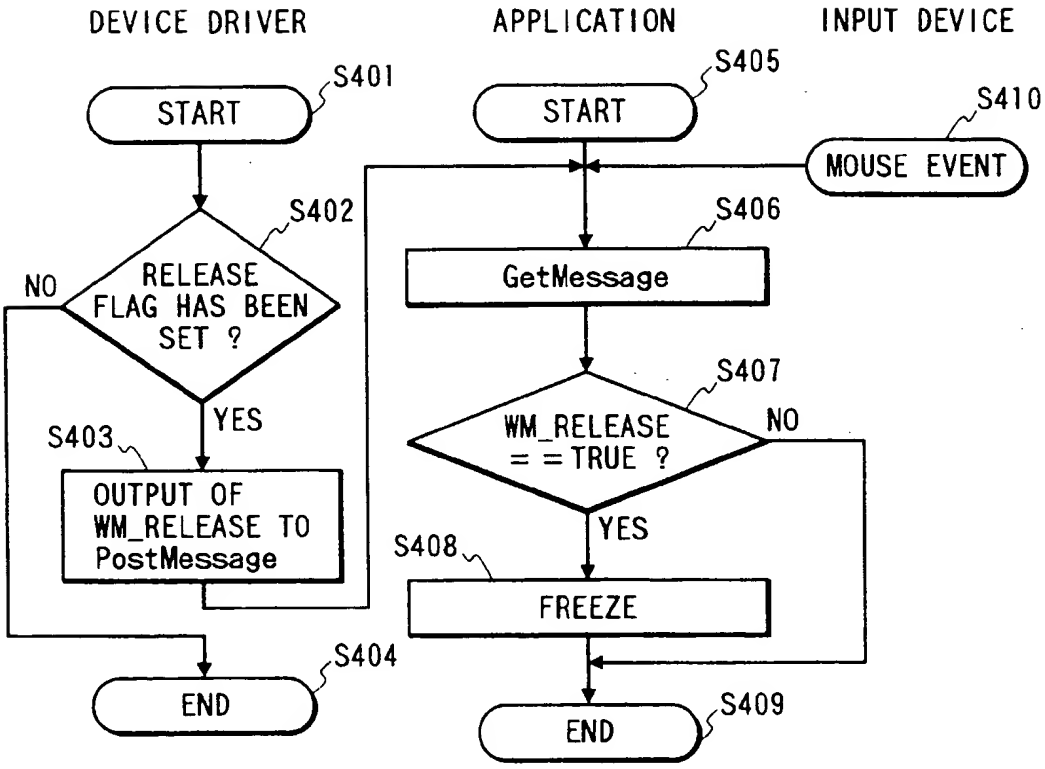

DEVICE DRIVER
APPLICATION
INPUT DEVICE
START
S401
S405
START
S410
MOUSE EVENT
S402
RELEASE FLAG HAS BEEN SET ?
NO
YES
S406
GetMessage
S407
WM_RELEASE = = TRUE ?
NO
YES
S403
OUTPUT OF WM_RELEASE TO PostMessage
S408
FREEZE
S404
END
S409
END

FIG. 5

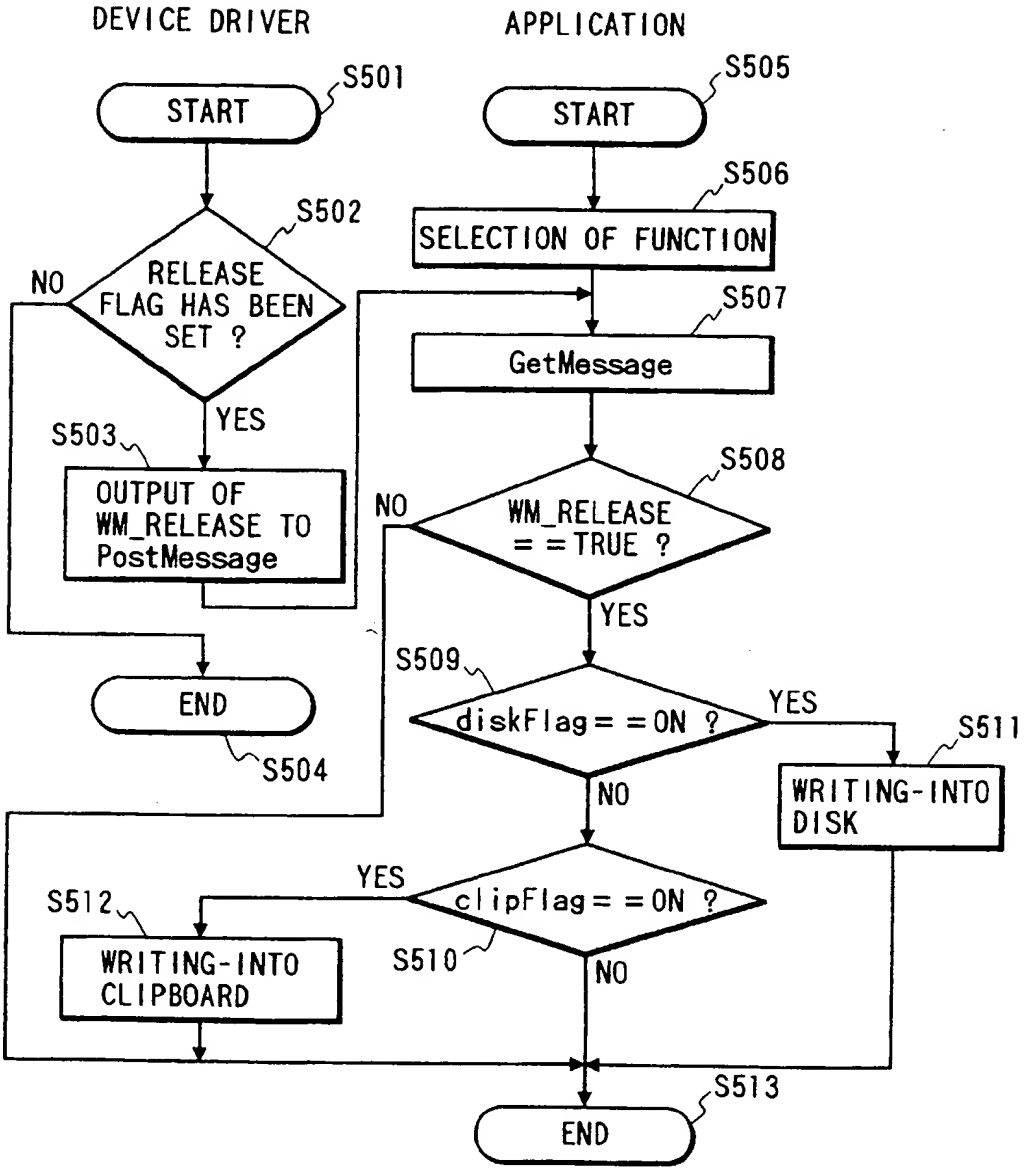

DEVICE DRIVER
APPLICATION
START
S501
S502
RELEASE FLAG HAS BEEN SET ?
NO
YES
S503
OUTPUT OF WM_RELEASE TO PostMessage
END
S504
START
S505
S506
SELECTION OF FUNCTION
S507
GetMessage
S508
WM_RELEASE = = TRUE ?
NO
YES
S509
diskFlag = = ON ?
YES
S511
WRITING-INTO DISK
NO
YES
clipFlag = = ON ?
S512
WRITING-INTO CLIPBOARD
S510
NO
S513
END

FIG. 6A

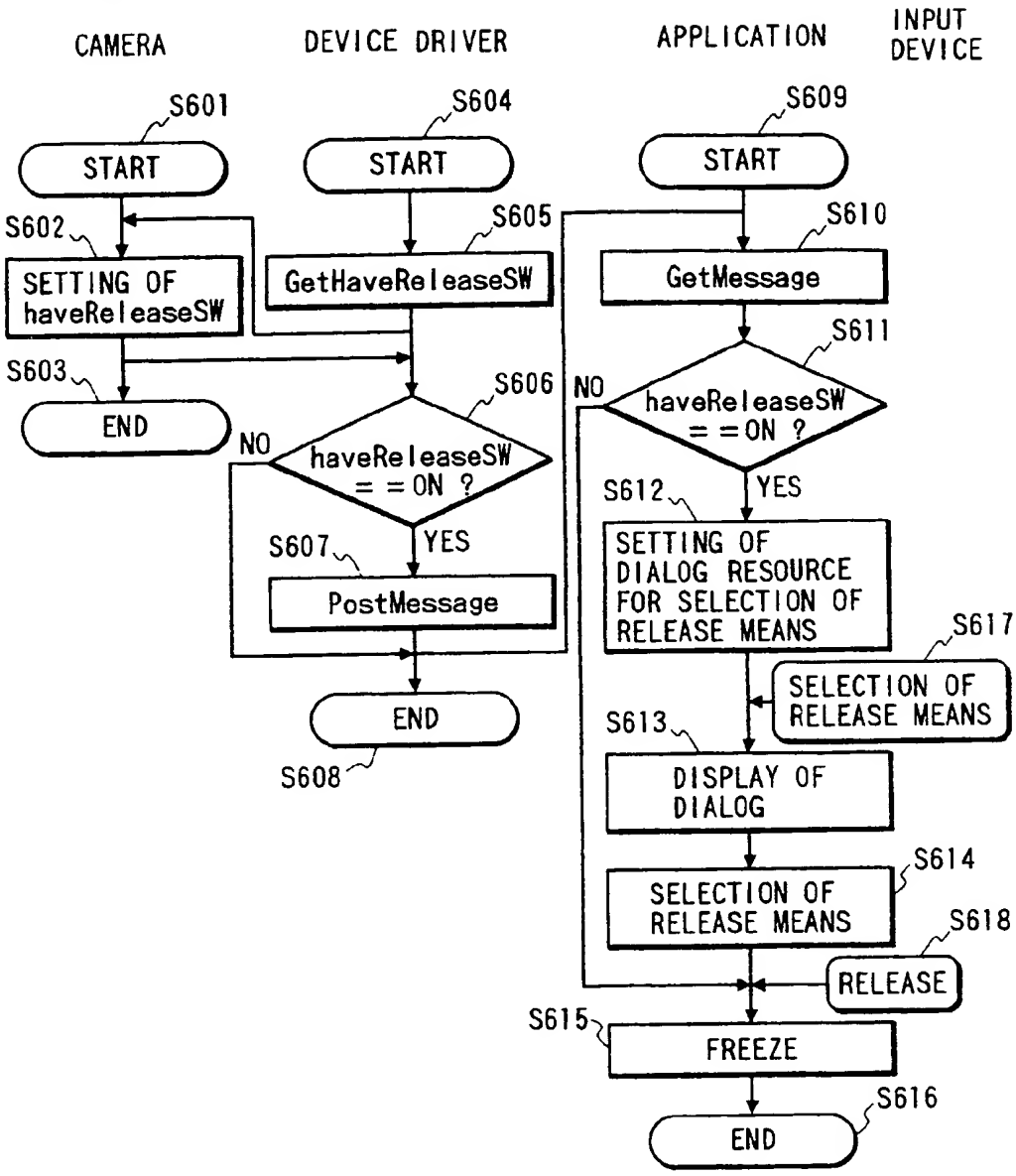

CAMERA
DEVICE DRIVER
APPLICATION
INPUT DEVICE
S601
START
S602
SETTING OF haveReleaseSW
S603
END
S604
START
S605
GetHaveReleaseSW
S606
NO
haveReleaseSW == ON ?
YES
S607
PostMessage
END
S608
S609
START
S610
GetMessage
S611
NO
haveReleaseSW == ON ?
YES
S612
SETTING OF DIALOG RESOURCE FOR SELECTION OF RELEASE MEANS
S617
SELECTION OF RELEASE MEANS
S613
DISPLAY OF DIALOG
S614
SELECTION OF RELEASE MEANS
S618
RELEASE
S615
FREEZE
S616
END

FIG. 6B

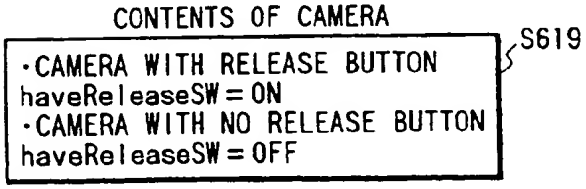
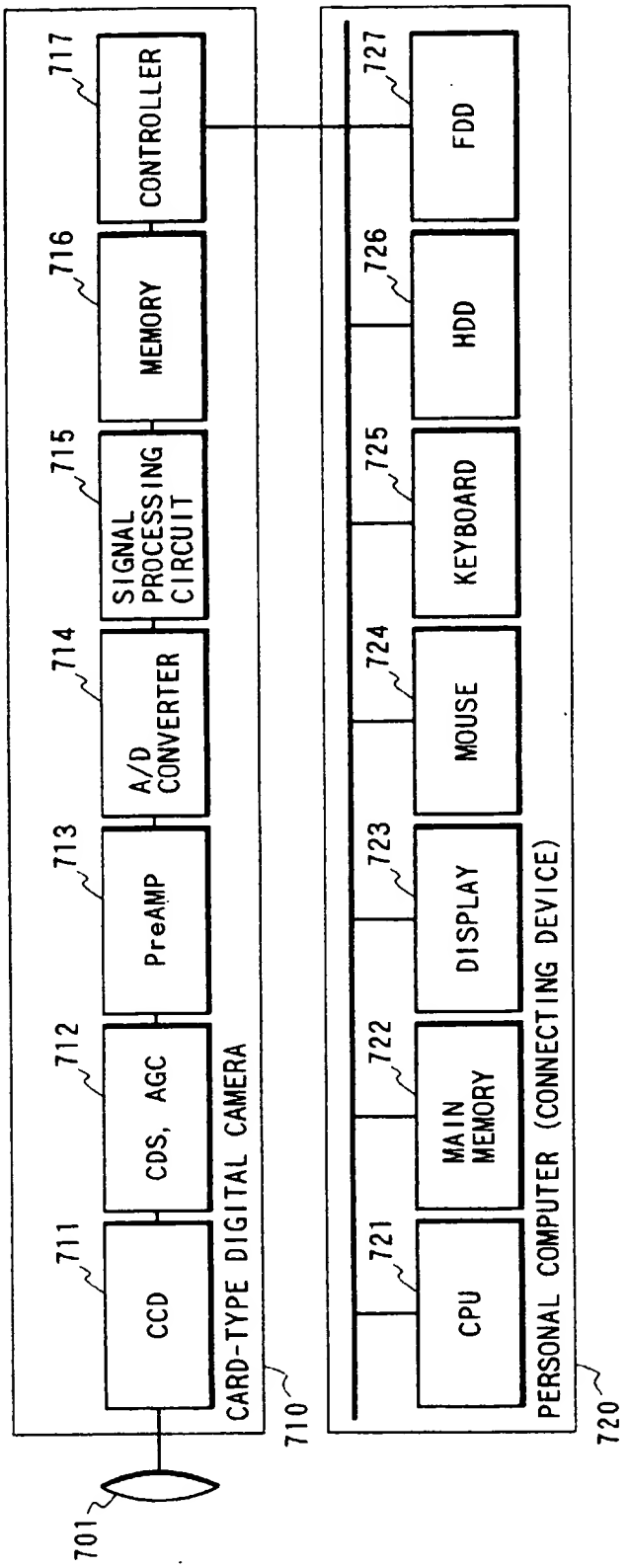

CONTENTS OF CAMERA
S619
·CAMERA WITH RELEASE BUTTON haveReleaseSW = ON
·CAMERA WITH NO RELEASE BUTTON haveReleaseSW = OFF

FIG. 7


701
CARD-TYPE DIGITAL CAMERA
710
CCD
711
CDS, AGC
712
PreAMP
713
A/D CONVERTER
714
SIGNAL PROCESSING CIRCUIT
715
MEMORY
716
CONTROLLER
717
PERSONAL COMPUTER (CONNECTING DEVICE)
720
CPU
721
MAIN MEMORY
722
DISPLAY
723
MOUSE
724
KEYBOARD
725
HDD
726
FDD
727

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High Holborn
London WC1R 5DJ (GB)

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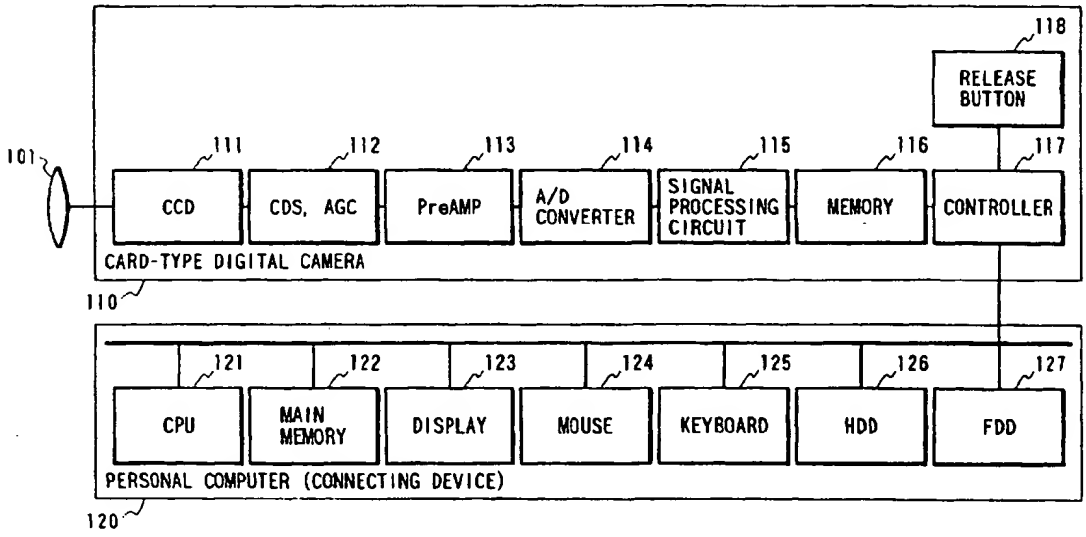
FIG. 1



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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 30 9920

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 402 170 A (PARULSKI KENNETH A ET AL) 28 March 1995 * column 2, line 49 - line 60 * * column 4, line 17 - line 60 * * column 5, line 34 - line 38 *	1,7	H04N5/232 H04N1/21 H04N1/00
X	"INTEGRATED COMPUTER AND CAMERA" IBM TECHNICAL DISCLOSURE BULLETIN, vol. 37, no. 10, 1 October 1994, pages 263-266, XP000475658	1,2,7,12	
A	* page 263, paragraph 3 - page 264, paragraph 2 *	6	
X	PATENT ABSTRACTS OF JAPAN vol. 097, no. 002, 28 February 1997 & JP 08 275098 A (KONICA CORP), 18 October 1996 * abstract *	1,2,7	
E	& US 5 828 986 A (HARADA TOSHIMITSU ET AL) 27 October 1998 * column 5, line 46 - line 65 * * column 9, line 61 - column 10, line 36 *	1,2,7	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04N
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	6 May 1999	Sindic, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 97 30 9920

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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